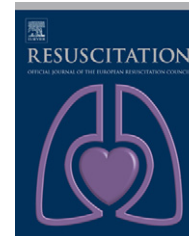




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MANIKIN AND SIMULATION STUDY

TO SEE OR NOT TO SEE—Better dispatcher-assisted CPR with video-calls? A qualitative study based on simulated trials[☆]

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Summary

Background: Video communication through mobile telephone is now available in many parts of the world. We ask how mobile phone video-calls compares with traditional phone calls for dispatcher-assisted cardiopulmonary resuscitation (T-CPR).

Methods: Primary data was collected through individual interviews with six dispatchers after their participation in simulated cardiac arrest. They had 10 scenarios each, during which they guided rescuers on resuscitation. During half of the scenarios they used video-calls, and traditional phone calls for the rest. Concepts from modern systems theory were used to analyse the material.

Results: Video-calls influenced the information basis and understanding of the dispatchers. The dispatchers experienced that (1) video-calls are useful for obtaining information and provides adequate functionality to support CPR assistance; (2) their CPR assistance becomes easier; (3) the CPR might be of better quality; but (4) there is a risk of “noise”.

Discussion: We emphasize visual observation as a way of constructing professional understanding when using video-calls, which may provide a new basis for dispatcher assistance. Video-calls may improve rescuer compliance. The role and content of telephone-directed protocols used by dispatchers may need adjustments when video-calls are used for medical emergencies.

Conclusion: Video communication can improve the dispatchers’ understanding of the rescuer’s situation, and the assistance they provide.

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Introduction

Mobile telephones have found their way into most people’s pockets and changed the way people interact during both work and leisure time. During medical emergencies, communication technologies are invaluable tools for communication, collaboration and coordination of resources. Soon, mobile video telephones might be used

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for emergency calls, and might be expected by the public as a standard. However, we need information on how this influences the quality of service. Our study focuses on how video communication compares with traditional telephony for dispatcher-assisted cardiopulmonary resuscitation (T-CPR).

For decades, bystander CPR has been considered important for survival after cardiac arrest.^{1–4} To improve outcome, assistance is provided by dispatchers over the telephone.^{5–10} The criteria of the dispatch protocols are considered important.^{11–17}

Telepresence and telemedicine are predicted to become important tools in trauma and emergency care.¹⁸ Studies assess safety, effectiveness and user satisfaction, and trials involve both pre-, inter- and intrahospital activity.^{18–20} A minor study explored the use of video-calls in T-CPR by lay rescuers and found that video-link instruction was comparable with direct observer instruction.²¹ Our study is the first in the field of video-supported dispatcher assistance using qualitative data.

We addressed the research questions on the basis of interviews with emergency medical dispatchers, after they had assisted in simulated trials of cardiac arrest.

Methodology

The trials

Sixty groups of students performed 60 trials during 3 days. The students were recruited from upper secondary school during regular class hours. Each group comprised three students and performed one single trial. Half of the groups were randomized to use mobile telephones with two-way video, the other half to use ordinary mobile telephones. The students were informed that they were to help a person aged about 50 years who had collapsed, and that they would receive telephone assistance for the rescue from a dispatch centre nurse. The phone was given one of the students in each group. We used a Laerdal Resusci[®] Anne manikin placed on the floor in a classroom to simulate cardiac arrest.

A total of six dispatchers performed single tests in turns, two persons per trial day. Each dispatcher first performed five trials using one type of telephone, then five using the other one. We randomly selected the first dispatcher and the first type of telephone tested each day. The dispatchers were told to assist lay people in simulated emergency situations. They were instructed to use the national dispatch protocol,²² updated with the latest CPR standards.²³

The respondents

The dispatchers were nurses at an emergency medical services centre. They had served as dispatchers from 1 to 10 years (median 3.8 years). Their age ranged from 28 to 51 years (median 33.5 years). Five women and one man participated. All had previously assisted CPR in their ordinary work. None of them had used video for dispatcher instructions prior to the trials.

Table 1 Principal interview questions

ABOUT EXPERIENCE FROM THEIR WORK DURING THE TRIAL:

- Was there a difference between the audio and the video, session?
- Why?

ABOUT HOW THEY EXPERIENCED THE USE OF VIDEO-CALLS DURING THE TRIAL:

- How was the picture quality?
- How was the sound quality?
- What was the experience of video-calls compared with using traditional telephony?
- Did video-calls have any useful aspects that traditional telephony does not have?
- Did video-calls have any disadvantages compared with traditional telephony?
- Did video-calls involve differences that were important to the communication and the information you can obtain and give in CPR?

The technology

Rescuers communicated either via standard mobile phone audio calls on a Sony Ericsson K800i (Sony Ericsson Mobile Communications AB, Lund, Sweden) or via combined audio and video-calls on a Nokia N90 mobile telephone (Nokia Corporation, Helsinki, Finland).

A work station was set up for both video and traditional audio communication. For audio-calls, the dispatchers used a telephone with a standard headset. For video-calls, the dispatchers used a laptop equipped with camera, video communication software (VT-phone Dilithium Inc.) and a standard headset. Video communication was done across a 64 kbit/s 3G-network.

During video communication, the dispatcher could see the rescue scene through the image continuously transmitted by the camera phone. The dispatcher could instruct the caller to change camera position. The caller could see the dispatcher on the phone's screen. During video communication, the mobile phone enabled hands-free audio by default, which allowed all rescuers to hear the voice of the dispatcher. With traditional audio communication, the dispatcher could communicate only with the person holding the phone.

The interviews

The dispatchers were interviewed individually after the trials had concluded. The interviews were conducted in Norwegian, the native language of the dispatchers and the interviewer. The interviews dealt with the experience of the dispatchers, and their reflections with regard to the suitability of video-calls compared with traditional phone calls. The principal questions were open-ended (Table 1).

Setting

The trials and interviews were carried out in Tromsø, Norway, in December 2006 and January 2007, as a part of a larger project.

Coding

The interviews were taped and transcribed in Norwegian. The material was coded with regard to the themes in the interview guide. Sections concerning changes in the dispatcher's work related to the use of video communication were labelled. The material was then coded using our theoretical analysis concepts. Variations and differences in the dispatchers' assessments were marked.

The coding process included analysis of the respondents' individual narratives to identify elements typical of the situations described.

Analysis

We analyzed the interviews using an abductive approach,^{24–29} a notion we apply to the process of moving from lay descriptions and meanings of social life to social scientific descriptions, concepts and theories. The concepts selected were a systems-theoretical conceptualization of communication, as consisting of the threefold differentiation of information, utterance and understanding. A fourth distinction is the difference between understanding and accepting or rejecting this understanding,^{30,31} in this framework called action. The focus of our analysis was whether the dispatchers acted differently because of the video communication.

Results

General impressions

The dispatchers found video-calls surprisingly easy to use. Dispatchers switching from video-calls to traditional phone-calls were surprised that they so quickly had adapted reliance on the picture:

- It was totally different to see them, actually... It was easier.
- When I got used to video-calls, it was a bit strange to go back to not seeing the scenario. ... I am trained to give instruction by phone without seeing. I am astonished that it was more difficult not to see the scenario once I had seen it.

In advance of the trials, the dispatchers expressed anxiousness about their participation and the use of unfamiliar technology. These feelings disappeared as their concerns proved to be unfounded:

- I felt like I was going to take an exam.
- I was anxious in advance, but it turned out to be very simple.

What it was possible to see

The dispatchers described that they could see that the rescuers was with the patient, that the patient was an adult and had no tight clothing around the neck, and how the patient was positioned. They also saw how rescue breaths were

given, and whether the rescuer's arms were straight during compressions. At times, it was possible to see whether the person giving compressions was getting tired. Some said they occasionally could see the chest rising. It was difficult, however, to see the compression depth and the position of the hands:

- With regard to the protocol ... I felt I did not need to nag about where the caller was in relation to the patient. Now I could see straight away that they were standing next to the patient. That the patient was not lying up in the loft, for example... (but) he was lying on his back, so I didn't have to nag with questions about what position he was lying in... And when they gave rescue breaths, I could see that they had put their fingers over his nose, so I didn't have to tell them. I also had a better view of how the compressions and breaths were being given. So I saw whether they were keeping their arms straight, and I saw when they were starting to droop and needed to change roles.
- When I asked them to place a person in the recovery position, I saw that they had not done that earlier.

Quality of images and sound

The image quality depended on how steadily the camera was held. Much movement had a negative effect on the picture. The visual details available to the dispatchers were thus variable, even though they could identify the main features in the picture most of the time:

- If they worked in parallel or changed position, there was just interference... But when they were giving compressions at a manageable pace, it was fine.
- Not everybody managed to keep still enough for me to see the quality of the rescue breaths... But in general it was very good.
- It is not very good for details... (but) I got a fairly good picture of what they did, and if it was correct.

The loudspeaker function of the callers' video telephone was appreciated. It made it possible to communicate with all the rescuers at the same time. The sound quality was described as acceptable, but it was pointed out that background noise could cause image and audio interference:

- The sound was excellent! Nothing to complain about!
- There was a bit of lag in the sound... (if they are) excited at the other end, there may be several voices at the same time... If you are outside with wind and noise from people and cars... it would be a bit disruptive.

Another way of working

The dispatchers were surprised that video communication made their work much easier, enabling an extra sense: sight. Several said they often create a mental picture based on what they hear. With video-calls they could see for themselves:

- Another way of working! (Q: How?) With a telephone call, you sit listening very intently, making sure that you have

heard right. Now I did not have to create a whole lot of pictures in my head... That was positive. I am surprised.

- Being able to use an extra sense made it much easier.
- You can see what you're asking about... very useful, very positive.

In their work the dispatchers had experienced that the caller's situation could be significantly different to what they had understood. This could apply to apparently simple questions, such as whether the patient was present. Some had experienced giving a caller instructions in CPR, while the patient was somewhere else. Still, they were surprised during the trials, when they saw how rescuers could respond to their instructions:

- It is easier to have preconceptions... when you only hear than when you both see and hear. You can create a picture which is real.
- You see the things you often wonder about... You get confirmation.

The callers' conception of what they should relate, their ability to express themselves, and their ability to handle the situation all influence on what they tell the dispatcher. With video-calls, the dispatchers could investigate themselves. When rescuers did not seem to understand the instructions, the dispatchers could try new approaches:

- They are not in my head and I am not in theirs... I got a much clearer picture of what they knew and were capable of.
- If I see that you have not understood, OK, then maybe I must say it to you in a completely different way... I got an impression of how they were working, and saw for example that when they were supposed to place him in the recovery position, they did not understand what I meant. I thought they had understood, but they had not. And then I read to them from the protocol, but they did not understand. That was useful to see. Very useful.

With video-calls, there was a great deal the dispatchers did not have to ask about. It became easier to provide assistance and to correct actions. Some dispatchers thought that precious time was saved in gathering information, both at the beginning and during the call. Others said video communication possibly might cause interference and thus cost time:

- I did not have to nag about how things were and things that they had already done. That causes a distraction from what they really needed help for.
- After all, it has a direct effect on guiding them through things that a caller under stress may not manage to communicate.
- It is a matter of seeing the response to your assistance directly.
- Life is at stake, and every minute counts. You save the minutes you spend asking.

Disadvantages

Loss of the dispatcher's identity protection, by being visible to callers, was described as a disadvantage of video-calls. This includes the risk of being recognized and becoming vulnerable to harassment and assaults from confused, unbalanced and aggressive people:

- I do not want to reveal who I am.
- They may be threatening, aggressive. Then I feel a bit sceptical about them being able to see who they are talking to... They could be anyone at all, someone who has killed someone... That might be the greatest disadvantage.
- The times that the person says: "Look, I want to tell you about something, but I don't want anybody else to know about it..." Or wants to be completely anonymous and just talk a bit.

It was mentioned that video-calls could confront the dispatchers with negative impressions to a greater extent and cause additional strain:

- If someone has hurt other people... if you were to see everything... all the terrible things where people are killed and die in car crashes—I think that in the long run it would wear you out.

Some wondered whether video-calls used during medical emergencies could be misused, for example if the caller distributed videos to mass media:

- I actually cannot think of any disadvantages offhand, other than that it could be misused in relation to the media or... that the pictures could reach people who should not see them.

Interference rather than information?

Video communication provides more information and more impressions of which some might be unnecessary "noise". Some said that this might interfere with the assistance:

- That is the weakness, that it does not take so much happening in front of the camera before it becomes chaotic... You mustn't bring too many elements into a stressful situation.
- If there is a major traffic accident or other situations—it is difficult for me to know whether I would manage to keep my focus on what I should be concentrating on.

Also, video-calls introduced "a new point of focus", and at times the protocol was left in favour of watching the video:

- In one way you get more things that you must focus on... what you see... what you hear... on the protocol and at the same time you must keep track of the ambulance and all that. So you really get a lot of information. And you have to act on it.

- The only “disadvantage” I can think of, is that you might forget the protocol a bit; you get a bit preoccupied with the picture. But I think that is just a matter of practice.
- I noticed that I departed from the protocol more, I watched the people who were working, and feel that was okay.
- You get very focused on the picture... Once the picture disappeared, I in a way lost track of the assistance I was giving because I was very preoccupied with watching.

Both when the dispatchers switched to traditional phone-calls and when the picture was too poor, the dispatchers were concerned about what they “should have seen”. Several discussed the risk of becoming “dependent” on the picture, and that such dependency might interfere with and delay the assistance. Some questioned whether the video image might lure the dispatcher into forming an opinion of what was happening too quickly, and blind dispatchers to other adequate information. At the same time, it was assumed that this was a matter of habit and training:

- You get a bit wrapped up in the picture. But I would think that would be at the beginning when you’re not really used to using it.

Discussions

In this study, dispatchers reported their first experience with the use of video communication during simulated cardiac arrest. Video communication affects the understanding and acts of the dispatchers differently than traditional telephone calls.

Adoption of the visualized, but new complexity

The dispatchers found it both surprising and distracting to experience dependence on the picture once they had used it. The adoption of reliance on visualized information arose after limited experience with video-calls, and despite the dispatchers’ training and experience in using traditional phone-calls. We regard this as an expression of visual orientation in western medicine. In this respect, the dispatchers’ “dependence on” and “benefit from” the video reflect the same phenomenon; they use their “clinical vision” to obtain professionally adequate information.

The dispatchers did not doubt the usefulness of the pictures. However, they questioned whether there could be “too much” information, and they experienced the need to alternate between several points of focus: the picture, what rescuers were saying, and the dispatcher protocol. We interpret this is a result of more interaction-based communication.

When communication takes place face-to-face, it is relatively easy to observe the reactions to a communication proposal, and reactions can be anticipated. Physical closeness promotes adaptation and support, while the risk of rejection increases when the communication takes place with people who are not present and with many parties. This is highly relevant to societies and social systems with technical distribution media.³¹ It is asserted that the “interaction medium”, differentiated on the basis of the two-way

structure of telecommunications, enables more highly specialized operations in social systems.³² As a medium for interaction, video-calls are richer in information than traditional telephony, enabling an immediate response to a greater extent. The communication is closer to face-to-face communication than with traditional telephony.

Personal inspection

Personal visual inspection makes professional judgements possible without requiring the dispatchers to rely on callers’ verbal expressions. In this way, video communication changes the basis for the dispatchers’ understanding of what is happening, and reduces the risk of misunderstandings. It becomes easier for dispatchers to judge whether their own messages were absorbed by the caller, and whether it was understood, misunderstood or rejected. On this basis, they can adjust their interpretation and the assistance they provide. The physical work with the patient can be more continuous and the rescue activities more efficient if the rescuers are interrupted less often by questions from the dispatcher. We revealed a potential for increasing dispatchers’ competence by using video-calls. With video-calls the dispatchers obtain the possibility to distinguish between what they themselves observe and understand and what rescuers do, and they can see how their assistance is followed up in the callers’ actions.

Teamwork

Video communication may affect the collaboration by influencing not only the dispatchers understanding and action, but also the rescuers’. Low rates of citizen CPR have led to introduction of dispatcher-assisted telephone CPR instructions.^{33p 124} These instructions “are believed to improve survival chances, by increasing the number of persons receiving CPR and facilitating earlier intervention”.^{16 p 204} Feelings of competence and courage are important for bystanders’ CPR intervention.⁴ It might reassure rescuers to see the dispatcher, and make it easier for them to get started with CPR if they know that they can be seen themselves. Video communication might thus improve the frequency of bystander intervention.

Researchers diverge with respect to the potential for trust in virtual teams.^{34–36} However, trust does become established in virtual teams as well. We hypothesize that the interactiveness of video communication can improve both reassurance and compliance on the caller’s part. It cannot however be ruled out that “to be seen” may also increase bystander hesitancy.

Leaving the dispatcher protocol

The dispatcher protocol has been drawn up after careful assessment of procedures and strategies. To train dispatchers to provide protocol-based directives over telephone has been one strategy to improve the frequency and earlier performance of T-CPR.³⁷ Protocols for questioning callers are designed to ensure that cardiac arrest is identified quickly and that CPR instructions are provided when appropriate.

Scripted CPR directions are also pointed out to reduce stress for dispatchers.

Dispatchers' experienced "several points of focus" and departed from the protocol in favour of seeing for themselves. The reason may be that working with video-calls was unfamiliar, and its introduction in daily work would raise training issues. However, today's protocol has been designed on the basis of verbal communication. The design and role of the protocol may have to change when used for video communication. Further research is needed in this area.

Methodological issues

We saw that the dispatchers' anxiousness and scepticism gave way to an exciting and instructive experience. We cannot rule out that feelings of relief and positive experience associated with the study are transferred to video communication (cf. "the Hawthorne effect"³⁸).

The lay CPR providers in the study were groups of students at school. Further studies are needed on the use of video telephones in other settings.

Conclusions

This study has shown that the dispatcher's visual inspection creates the basis for better synchronization of the rescue activities during bystander CPR. We conclude that video communication can improve dispatchers' understanding of the rescuer's situation and improve the guidance they provide. More knowledge and further studies are needed before this novel technology is implemented in dispatch centres.

Conflict of interest

None stated.

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